REMARKS

Applicant's counsel thanks the Examiner for a very thorough examination of the present application. Claims 1, 2, 19-20, 23, 35 and 36-37 have been amended in response to the Examiner's rejections. Claims 24-26, 30-33, 38 and 41 have been amended to more clearly describe the invention and to correct typographical and grammatical errors not affecting the scope of the claims. New claims 42-47 have been added, also to more clearly describe the invention. No new matter has been entered.

Claim 1 has been rejected under 35 USC § 102(b) as being anticipated by Kubota (JP 56-095479) on the ground that "Kubota discloses cladding a copper-aluminum alloy on steel...." See Office action, page 4. Claim 1 has now been amended to recite "said cladding having an initial thickness of at least 0.012 inches prior to being pressed to said base metal alloy." For the Examiner's convenience, basis for this limitation can be found in Table 1. Kubota is entirely silent as to the initial thickness of the cladding prior to being pressed to "said base metal alloy." Therefore, the rejection of claim 1 over Kubota has now been overcome.

Claim 1 has also been rejected under 35 USC § 103(a) for obviousness over Forand. Forand discloses a copper and/or aluminum layer being clad to a steel sheet with the copper and/or aluminum "having thicknesses within the range of 0.001 of an inch and 0.010 of an inch." Col. 3 lines 20-22. Forand goes on: "It is *extremely difficult if not impossible* to clad the above thicknesses of steel with copper and/or aluminum having thicknesses greater than disclosed above because the

copper and/or aluminum 'alligator' during...cold-rolling...." Col. 3 lines 22-26. As amended, claim 1 now clearly recites that the cladding layer (copper and aluminum) has "an initial thickness of at least 0.012 inches prior to being pressed to said base metal alloy." It would not have been obvious, starting from Forand, to arrive at the presently claimed invention because Forand specifically teaches that to increase the aluminum and/or copper layer thickness to the range now claimed would result in failure (alligatoring) of the cold-rolled composite. Therefore, the rejection of claim 1 over Forand has now been overcome.

In view of the above, the rejections of claim 1 have now been overcome, and claim 1 is now believed to be allowable.

The Examiner has rejected claim 2 under 35 USC § 102(b) as being anticipated by Miller or Heronemus. Claim 2 has now been amended to recite "said cladding being essentially free of zinc and comprising nickel in a proportion of 10% to 28%." First, with regard to Miller, the nickel-copper alloy (nickel silver layer 14) that is clad to the steel core layer 12 contains a substantial amount of zinc. See col. 2 lines 21-22: "Nickel silver is a silver-white alloy principally embodiying copper, nickel and zinc." See also table II listing nickel silver compositions having 17-25% zinc. As amended, claim 2 recites a cladding that is "essentially free of zinc" and therefore now defines over Miller. Basis for this limitation can be found in the specification at page 12 line 19 - page 13 line 1 where it is disclosed that zinc is detrimental to the vacuum brazing process for which the self-brazing alloy is used, and therefore zinc "will be avoided." According to MPEP § 2173.05(b)(B),

"essentially free of" language is permissible when the specification contains guidelines "sufficient to enable a person of ordinary skill in the art to draw a line between unavoidable impurities in starting materials and essential ingredients." This is exactly the case here where zinc is disclosed as being a by-product in copper alloys, and is to be avoided as much as possible due to its detrimental effect on the vacuum brazing process.

Second, with regard to Heronemus, this reference does not disclose or suggest a cladding layer "being essentially free of zinc and comprising nickel in a proportion of 10% to 28%." Rather, Heronemus at col. 6 lines 20-27 discloses a heat exchanger jacket "may be formed from a steel sheet 13 clad on one side with a copper-nickel alloy layer 14. A typical panel side sheet...could comprise a sheet of SAE 1020 carbon steel... on one side of which is rolled a layer of Cu-Ni alloy 715...." Alloy 715 is a Cu-Ni alloy of 70% copper and 30% nickel, and therefore has a composition outside of the presently claimed range of 10-28 percent nickel. Therefore, Heronemus does not anticipate claim 2 as amended. Furthermore, the claimed 10-28 percent nickel composition is not made obvious by Heronemus because there is no motivation, starting from Heronemus, to vary the nickel concentration in the cladding layer to address any known or recognized deficiency. The claimed range is suited for self-brazing alloys as described and claimed in the present application. As the Examiner himself has recognized, Heronemus does not contemplate brazing the materials or layers disclosed therein, and certainly does not contemplate a self-brazing alloy, so there is no motivation to modify the 715 alloy

disclosed in Heronemus to achieve the applicant's claimed range.

Claim 2 has also been rejected under 35 USC § 103(a) for obviousness over applicant's disclosure of the prior art in view of Okubo. Specifically, the Examiner states that "Okubo...clearly discloses that copper-nickel layer combinations are useful as self-brazing compositions since the nickel increases the adhesion of the copper." Respectfully, the Examiner's understanding of Okubo is incorrect. In Okubo, a nickel layer is disposed between a steel substrate layer and a pure copper layer to improve the adhesion bond between the copper layer and the steel substrate. According to Okubo, the nickel layer *is not present* to improve "adhesion of copper" to a brazing substrate as the Examiner's remarks imply. Rather, the nickel layer is present to improve the adhesion of copper *to the steel substrate*. See col. 5 lines 37-42: "While it is advantageious to apply a Ni coating to enhance adhesion *of the copper coating to the steel sheet*, an excessively thick Ni coating should be avoided, since it causes voids to occur in the copper fused layer formed by self-brazing."

Contrary to the Examiner's position, Okubo does not teach that nickel is advantageous to self-brazing copper layers, and in fact clearly states that nickel *can be detrimental* to the self-brazing copper layer. Conversely, in claim 2 the cladding layer itself consists essentially of copper and nickel where nickel is present in the proportion of 10-28 percent. Nothing in Okubo discloses or suggests such a combination. Furthermore, because nickel is not provided in the copper-containing brazing or cladding layer in Okubo, and further because Okubo specifically

discloses that nickel is *detrimental* to the copper self-brazing process, Okubo provides no motivation to add nickel to the copper cladding (brazing) layer, and the rejection of claim 2 over Okubo is overcome.

In view of the foregoing, it is believed that claim 2 now patentably defines over the cited references and is now allowable.

Claim 23 has been rejected under 35 USC § 103(a) over Forand. Claim 23 has been amended to recite "said aluminum layer having an initial thickness of at least 0.012 inches prior to being metallurgically bonded to said copper layer." Basis for this limitation can be found in Tables 1 & 2. Therefore, claim 23 is now allowable over Forand for the same reasons as discussed above regarding claim 1.

Claim 35 has been rejected under 35 USC § 103(a) over applicant's disclosure of the prior art in view of Okubo. Claim 35 has now been amended similarly as claim 2 above, and is therefore now allowable over Okubo for the same reasons discussed above regarding claim 2.

Claims 8-9, 12 and 27-28 have been rejected under 35 USC § 103(a) as being unpatentable over applicant's disclosure of the prior art in view of Forand. With respect to claims 8-9 and 27-28, each of these claims recites a copper layer thickness of 0.030 inches. The Examiner states at page 5 of the Office action that "[r]egarding claims to specific layer thicknesses, Forand gives various guidelines for layer thickness, and it would have been obvious to one of ordinary skill in the art to use any layer thicknesses within Forand's general guidelines." While this statement may be true, the copper layer thickness of 0.030 inches recited in each of the above rejected claims *does not fall within* "Forand's general guidelines." The only guideline for layer thickness given in Forand appears at column 3 lines 18-27, where Forand discloses that steel substrates "can be clad with copper and/or aluminum having thicknesses within the range of 0.001 of an inch and 0.010 of an inch." The claimed 0.030 inch thickness for the copper layer recited in claims 8-9

and 27-28 falls well outside this range, at three times the upper limit disclosed in Forand. Furthermore, it would not be obvious from Forand's range to utilize such a thick copper layer as 0.030 inches because in the next sentence Forand explicitly teaches that thicker copper layers cannot be used due to "alligatoring." In the remaining portion of column 3, and at column 4 lines 1-31, three examples of composites are disclosed, only two of which include a copper layer. In each of these, the copper layer is 0.005 inches thick; well within Forand's above-described range, and well below the 0.030 copper layer thickness recited in claims 8-9 and 27-28.

Regarding claim 12, this claim recites the final gauge of the clad self-brazing material being 0.017 inches. Again looking to Forand, the three composites disclosed in columns 3 and 4 each respectively recite the following layers and initial thicknesses:

1. 0.005" copper, 0.003" aluminum alloy, 0.080" ferrous substrate (col. 3 lines. 36-64);

2. 0.003" aluminum foil, 0.090" ferrous substrate (col. 3 lines 61-65); and

3. 0.005" copper strip, 0.090" ferrous substrate (col. 4 lines 10-25).

In Forand, each of the above was subject to cold rolling step and a subsequent hot rolling step to reduce the thickness as follows:

1. reduced 10% by cold rolling (C.R.) then 36% by hot rolling (H.R.);

2. reduced 20% C.R. then 30% H.R.; and

3. reduced 10% C.R. then 47% H.R. then again by C.R. to final gauge of 0.031".

Doing the math, the first composite had a total initial thickness of 0.088" (0.080+0.003+0.005), and was reduced 46% (10%+36%) to 54% (100%-46%) of its total initial thickness. So the first composite had a final gauge of 0.047". Performing the similar calculation for the second composite, it had a final gauge thickness of 0.046". Forand clearly recites the final gauge thickness of the third composite as 0.031". Comparing these to the recited 0.017" final gauge thickness of claim 12, it is

clear that none of these anticipates the claimed final gauge of 0.017" which is significantly less (about or less than half) those disclosed in Forand. Furthermore, Forand provides no motivation (i.e. no reason) to produce so fine a final gauge as 0.017 inches, and therefore does not make claim 12 obvious.

In view of the above, it is respectfully submitted that claims 8-9, 12 and 27-28 are not anticipated or made obvious over Forand's "general guidelines" of layer thickness, and that these claims are therefore now allowable.

Claims 22 and 39 have been rejected under 35 USC § 103(a) as being obvious over applicant's disclosure of the prior art in view of Okubo. Both claims 22 and 39 recite a nickel layer having a thickness of 0.010". Conversely, Okubo explicitly discloses that the nickel layer "if any, should have a thickness of 1 mm or less." Okubo, col. 5 lines 40-42. One micron (1 mm) is equal to 3.937×10^{-5} inches (0.00003937"). Therefore, the nickel layer recited in Okubo is three orders of magnitude smaller than the 0.010" required by claims 22 and 39. This discrepancy is easily understood when one considers that in Okubo the nickel layer is applied to enhance copper-to-steel bond adhesion as described above, whereas in the present invention the nickel is provided *as a component of the self-brazing cladding layer.* Therefore, the 0.010" thickness of nickel recited in claims 22 and 39 is not rendered obvious over Okubo, and this rejection has been overcome.

Regarding new claim 43, this new dependent method claim adds the additional method step of "brazing said self-brazing alloy to a metal surface at elevated temperature." As the Examiner has recognized, none of the cited references (except Forand) contemplates or is even remotely concerned with brazing. Furthermore, claim 43 patentably defines over Forand for the same

reasons explained above with respect to claim 1. Therefore, new dependent claim 43 is believed independently allowable.

Accordingly, the rejections of claims 1-2, 8-9, 12, 22-23, 27-28, 35 and 39 have now been overcome. In addition, new claim 43 is believed to be independently allowable. All remaining claims are dependent claims and should thus also be allowable as such.

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Respectfully submitted,
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